GOSSYPIUM TRILOBUM: AN ADDENDUM

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Existing knowledge concerning *Gossypium trilobum* (Moc. & Sess. ex DC.) Skov. emend. Kearn., has been summarized by Fryxell (1965a). He concluded that this species is distinct from *G. thurberi* Tod. in spite of much nomenclatural confusion, but is more closely allied to the latter than to *G. gossypioides* (Ulbr.) Standl., as was suggested by Phillips (1966). It was noted that the plant unfortunately was not available in any of the living collections of *Gossypium* upon which the extensive experimental work with this genus has been and continues to be based. Some recent attempts to collect living material of this species have been unsuccessful.

On the basis of the distributional data summarized in the previous study, we planned to recollect this species, with the special intention of adding living material to existing *Gossypium* gardens. Accordingly, we visited the Mexican states of Sinaloa, Jalisco, Michoacán, México, Guerrero, and Morelos, where the plant is known to occur. Established populations of *G. trilobum* were eventually found in Michoacán, and both living and preserved specimens were collected. The present communication reports observations on these collections.

This trip was supported by the junior author's National Science Foundation Grant GB3900. The trip was undertaken to collect fresh petal tissues of *Gossypium* spp. for chemotaxonomic analysis from the winter garden at Iguala, Guerrero, Mexico, maintained jointly by the U.S. Department of Agriculture and the National Cotton Council, in cooperation with the Mexican government, and to introduce *G. trilobum* into cultivation. The authors were aided in these collections by Kenneth Montgomery and David L. Dreyer.

Ecological observations. The city of Zitácuaro, Michoacán, is situaated at an elevation of 1,993 m. A road extends south from Zitácuaro down the valley of the Rio Zitácuaro and across to the valley of its tributary, the Rio Temascaltepec, where it reaches the town of Tuzantla. The Zitácuaro-Tuzantla road descends steadily as it progresses southward. We found populations of *G. trilobum* at km 9 and at km 21, at elevations of approximately 1,800 m and 1,600 m respectively. The km 9 site represents the upper altitudinal limit from which plants of this taxon have been collected. Previous collections (Fryxell, 1965a) have been recorded at altitudes of 800 m to approximately 1,500 m.

The most well-developed specimens grew on a steep rocky slope fully exposed to the sun, in what appeared to be undisturbed vegetation. Although other large bushes and small trees grew on the slopes with the *Gossypium,* they were too scattered to compete directly for light. The hillside also had a good if not dense covering of grasses and forbs, compared to habitats typical for *Gossypium,* which generally are more arid and open.

Other plants of *G. trilobum* were observed growing in the fence row, along the roadside, and at the edges of cultivated fields (i.e., in disturbed situations in dense, weedy, and shrubby vegetation). Some of these specimens had been cut (or grazed) in the past, and thus had a more shrubby aspect. Plants of *G. trilobum,* apparently established at the time of disturbance, appeared able to compete successfully with their weedy neighbors; but whether seedlings of *G. trilobum* can succeed in establishing themselves in such dense vegetation is doubtful. The only seedling found was in bare rocky soil near the edge of the road with no other plants in shading distance. It will be necessary, during the right season, to observe germination and seedling establishment in the field. Comparisons of the disturbed and undisturbed habitats in this regard will permit definite statements concerning the competitive ability of *G. trilobum* seedlings.

The plants of *G. trilobum* described above were growing in a habitat apparently typical for the species, one fully exposed to strong insolation. However, a few plants were found in quite a different habitat. At one side of the road near km 21 there is a canyon several hundred feet deep, with nearly vertical sides that drop down to a stream at the bottom. A trail cut into the side of the canyon wall enables one to descend to the bottom. A few plants of *G. trilobum* were observed on this canyon wall, growing in the shade resulting from a heavy growth of brush and scattered trees, and from the curtailed daylength of the narrow canyon. The original canyon inhabitant, a large and possibly old plant, may have reached its position in the course of a minor landslide. A few young plants were found below the older plant, some nearly to the canyon bottom. Apparently *G. trilobum* has a greater tolerance than most species of *Gossypium* for shading and more ability to withstand crowding.

The plants observed were in the full flush of flowering and had an ample crop of immature fruit in mid-October. Evidently the flowering and fruiting pattern of this species is similar to that of the closely allied *G. thurberi.* The latter species begins flowering abruptly in early autumn and then flowers and fruits heavily and rapidly, maturing a large crop of fruits within two months of the onset of flowering. It is vegetative (or dormant) for the balance of the season. This conclusion agrees with collection dates of flowering specimens cited previously (Fryxell, 1965a).

The origin of the boll weevil (*Anthonomus grandis* Boh.) has puzzled entomologists for some time. It has been suggested that one of the wild cottons of Mexico might prove to be the original host from which these insects later transferred to cultivated cotton. No convincing evidence has yet been put forward in support of this thesis. However, observations have never previously been made on *G. trilobum,* a species that in geographical terms might have played such a role. The plants here discussed were carefully examined for signs of weevil infestation,

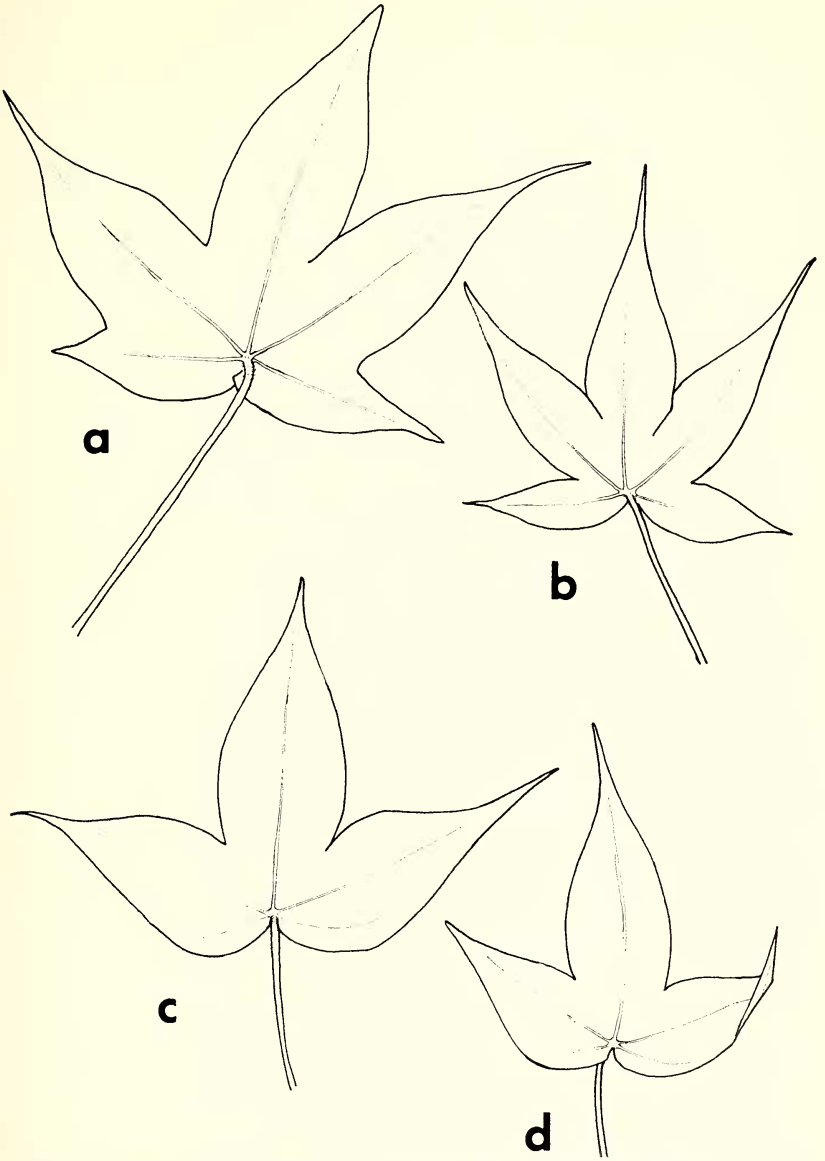

FIG. 1. Leaves of *Gossypium trilobum,* showing the five-lobed form (a, b) typical of the vegetative stalks, and the three-lobed form (c, d) typical of the sympodial flowering branches, × ½.

but none could be detected. This evidence suggests that *Gossypium trilobum* has not played a role as primary host of the boll weevil. Moreover, recent evidence (Fryxell & Lukefahr, 1967) indicates that the primary host may have been found in species of the genus *Hampea* Schlecht.

FIG. 2. Calyx of *Gossypium trilobum* with very young fruit showing distinctive form of margin, × 5.

Morphological observations. We were able to observe certain features in living plants that are difficult or impossible to observe in herbarium specimens, but which significantly extend our understanding of the species. The plants are large shrubs or small trees, 3 to 4 m in height, with a rounded crown. The trunks of the specimens on the undisturbed slope did not branch for ½–1 m above the ground, above which they

branched freely (in contrast to specimens of *G. thurberi* which branch freely at ground level and thus lack a single trunk).

The fruits of *G. trilobum* are predominantly three-loculed, but are rarely two-loculed. No fruits were seen with four locules. The fruits of *G. thurberi* are also predominantly three-loculed, but are occasionally four-loculed.

The involucral bracteoles have been described as cordate-acuminate and entire. This is essentially correct, except that the bracts on one plant *(Fryxell 562)* were weakly laciniate, rather than strictly entire. Bracts on other specimens showed minute, widely scattered teeth that were not superficially evident.

The leaves are a little more than ⅓ cut (fig. 1) on the average. A few leaves were nearly as deeply lobed as is typical of *G. thurberi,* but on the average the leaf dissection in this latter species is much greater than in *G. trilobum.* In both species leaf dissection is variable among the leaves of a given plant, depending on the position and exposure of the individual leaf, but the leaf spectra (Melville, 1953) of the two species are quite distinct. In young plants of the same age grown in culture, leaves of *G. trilobum* are less dissected than those of *G. thurberi.* In *G. trilobum,* climax leaves along the main stalk are typically five-lobed, whereas those occurring on the lateral fruiting branches are generally three-lobed. The specific epithet is derived from the latter type of leaf, since it is more commonly gathered and preserved in herbarium material because of its association with flowers or fruits. Some of the reduced, upper leaves are unlobed and ovate in shape. The foliar nectaries are only sometimes present on climax leaves. They are often but not always present on the trilobed leaves of the flowering branches.

The morphology of the calyx is a distinctive feature of the species (fig. 2). The calyx has been described as having a variable number of irregular divisions (Fryxell, 1965a). Examination of living material has clarified the nature of this structure. The calyx is basically five-lobed, a condition that is characteristic of the balance of the genus (although several species have calyces that are truncate by reduction). During the development of the bud of *G. trilobum,* each calyx lobe splits, generally into two parts, and thus gives rise to a calyx which usually has ten divisions. There is sufficient irregularity in this process, however, that both the number and the size of these divisions are variable. A similar development occurs in no other species of *Gossypium.*

Gossypium trilobum has been compared several times with the morphologically similar *G. thurberi* (Kearney, 1937; Fryxell, 1965a). Field observation of the plants confirms this similarity, both authors being already familiar with *G. thurberi* in its native habitat in the Sonoran desert. Specifically, the present observations confirm the hypothesis that these are a pair of vicarious species (Fryxell, 1965b).

Cytology. Buds were collected from two plants *(Fryxell 562, 563)*

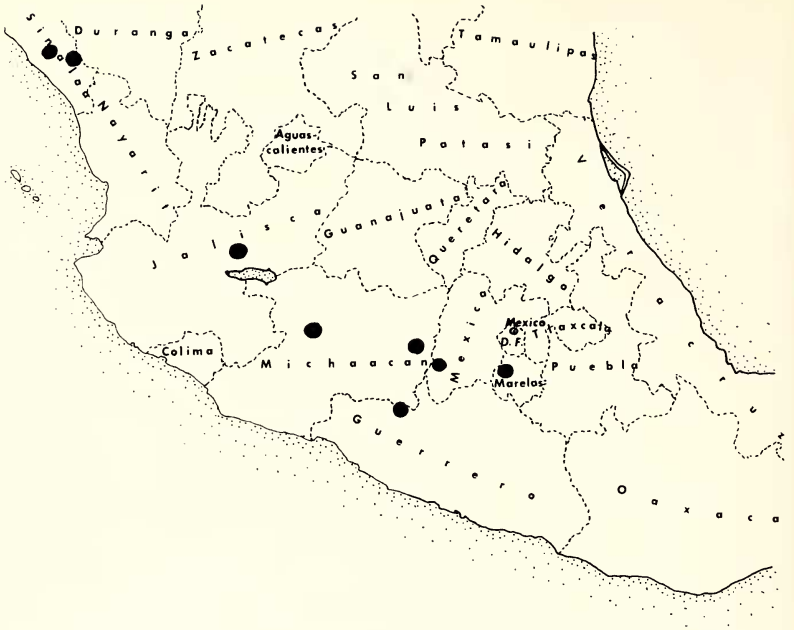

FIG. 3. Map showing known collection sites for *Gossypium trilobum*.

and examined cytologically by Meta S. Brown, Texas A&M University, whose collaboration is gratefully acknowledged. The gametic chromosome number was **n = 13**, and the chiasma frequency 1.8 chiasma per bivalent, as determined from the analysis of 926 bivalents from 74 PMC's. A low frequency of quadrivalent association was observed.

Additional Comments. Local residents were questioned about the plant, which was well-known to them. The people of the area do not use the plant but call it "algodoncillo" (meaning "little cotton"). They thus recognize its relation to cultivated cotton, even though *G. trilobum* produces no fiber.

By collating information about the distribution of *G. trilobum* (Fryxell, 1965a), the flowering pattern of the species (described above), and the itinerary of the botanists, Sessé and Moçino, who collected the type specimen of this species (Rickett, 1947), one can deduce that the type was probably collected in the autumn of 1790 in central Michoacán, as these collectors traveled from Pátzcuaro to Apatzingan.

The distribution map of *G. trilobum* (Fryxell, 1965a) indicates that the species is fairly widespread, extending more than 500 miles from southern Sinaloa to western Morelos. Yet the species has generally been regarded as rare. A plot of the known collection sites (fig. 3) indicates a concentration in the southern parts of the states of Michoacán and México, in those areas where the elevation provides a suitable habitat

for this species. The region concerned, possibly including the northwestern part of Guerrero as well, is one that is not readily accessible by good roads. Perhaps the apparent rarity of this species is consequent on botanists only rarely having penetrated to its native environs. This conclusion is borne out by local informants in the area south of Zitácuaro, where the present collections were made, being quite familiar with "algoedoncillo," and by the specific comment made by one of them that there were many more of the plants to be found in the surrounding hills. *Gossypium trilobum* has perhaps never been rare, only poorly known to botanists.

Herbarium material of *G. trilobum* obtained on the trip described in this paper *(Fryxell 562, 563, 564, 565, 567, 568;* and *Parks 257, 261, 264, 270*) will be deposited at the Tracy Herbarium of Texas A&M University (TAES) and at the Herbarium of the Los Angeles State and County Arboretum; duplicates will be distributed elsewhere. The collections were made under a permit granted by the Secretaria de Agricultura y Ganadería, Instituto Nacional de Investigaciones Forestales, México D.F. It is a pleasure to acknowledge the cooperative attitude of that office. Plants of *G. trilobum* have been established at the winter garden at Iguala, Guerrero.

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